Reasons and Preventions of Materials Wastage in Building Construction

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Abstract: The main objective of this project is to study different techniques for resisting lateral forces acting on structure. The method studied and analyzed are shear walls and bracing. The project also aims at finding the most suitable method along with the design of a G+25 structure using infill wall, shear wall and bracing. The analysis is carried out using analytical methods.

Keywords – Wastage, Building Construction, prevention.

I. INTRODUCTION

The quality of materials used and the management of material waste in building projects are of paramount importance. Obviously, the control of quality of materials used leads to savings from materials wastage. It is generally an accepted phenomenon that not all the materials requested and delivered to construction sites are used for the purpose for which they are ordered. Also, contractors often use sub-standard materials after billing their clients with standard material's cost. Due to lack of control, these materials are either lost or the quality is not met.

Waste costs money at any level of the construction and should be the concern of all the parties in the construction team as it gives rise to loss of resources. In respect to this, this study is focused at investigating the causes of materials wastage and their contribution to materials wastage on building projects.

II. SCOPE OF PROJECT

The research is based on some of the construction materials like Steel, Brick, Cement and Sand. The research is limited on the taken three buildings which are commercials.

III. METHODOLOGY

• Site visit to the different construction projects and data collection from visits.

• Analyze the data and find out wastage proportion in the construction.

• Study the effect of wastage on project cost.

• Find out the causes of wastage on site by experience and discussion with Project Managers.

IV. LITERATURE REVIEW

According to the new production philosophy, waste should be understood as any inefficiency that results in the use of equipment, materials, labor, or capital in larger quantities than those considered as necessary in the production of a building. Waste includes both the incidence of material losses and the execution of unnecessary work, which generate additional costs but do not add value to the product (Koskela 1992). Therefore, waste should be defined as any losses reduced by activities that generate direct or indirect costs but do not add any value to the product from the point of view of the client.

Besides a clear understanding of the general concept of waste, it is helpful to use a classification of waste in different categories, in order to understand the wide range of possible corrective actions related to its prevention.

Regarding the possibility to control the incidence of waste, this study admits that there is an acceptable level of waste, which can only be reduced through a significant change in the level of technological development. Thus, waste can be classified in unavoidable waste (or natural waste), in which the investment necessary to its reduction is higher than the economy produced, and avoidable waste, when the cost of waste is significantly higher than the cost to prevent it. The percentage of unavoidable waste in each process depends on the company and on the particular site, since it is related to the level of technological development.

Waste can also be classified according to its origin, i.e. the stage that the main root cause is related to. Although waste is usually identified during the production stage, it can be originated by processes that precede production, such as materials manufacturing, training of human resources, design, materials supply, and planning.

The main classification of waste proposed in this study is by its nature, since it helps managers to understand the different forms of waste, why they occur and how to act in order to avoid them. The following classification resulted from a study developed at UFRGS, based on Shingo's seven wastes (Shingo, 1989):

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Overproduction: related to the production of a quantity greater than required or earlier than necessary. This may cause waste of materials, man-hours or equipment usage. It usually produces inventories of unfinished products or even their total loss, in the case of materials that can deteriorate. An example of this kind of waste is the overproduction of mortar that cannot be used on time. ·

Substitution: is monetary waste caused by the substitution of a material by a more expensive one (with an unnecessary better performance); the execution of simple tasks by an over-qualified worker; or the use of highly sophisticated equipment where a much simpler one would be enough.

Waiting time: related to the idle time caused by lack of synchronization and levelling of material flows, and pace of work by different groups or equipment's. One example is the idle time caused by the lack of material or by lack of work place available for a gang.

Transportation: concerned with the internal movement of materials on site. Excessive handling, the use of inadequate equipment or bad conditions of pathways can cause this kind of waste. It is usually related to poor layout, and the lack of planning of material flows. Its main consequences are: waste of man hours, waste of energy, waste of space on site, and the possibility of material waste during transportation.

Processing: related to the nature of the processing (conversion) activity, which could only be avoided by changing the construction technology. For instance, a percentage of mortar is usually wasted when a ceiling is being plastered.

Inventories: related to excessive or unnecessary inventories which lead to material waste (by deterioration, losses due to inadequate stock conditions on site, robbery, vandalism), and monetary losses due to the capital that is tied up. It might be a result of lack of resource planning or uncertainty on the estimation of quantities.

Movement: concerned with unnecessary or inefficient movements made by workers during their job. This might be caused by inadequate equipment, ineffective work methods, or poor arrangement of the working place.

Production of defective products: it occurs when the final or intermediate product does not fit the quality specifications. This may lead to rework or to the incorporation of unnecessary materials to the building (indirect waste), such as the excessive thickness of plastering. It can be caused by a wide range of reasons: poor design and specification, lack of planning and control, poor qualification of the team work, lack of integration between design and production, etc.

Others: waste of any nature different from the previous ones, such as burglary, vandalism, inclement weather, accidents, etc.

CAUSE OF WASTE GENERATION:

There may be numerous causes responsible for the generation of waste in different systems. However, some general causes of waste generation at different stage have been perceived. The check list of causes of waste generation as below:

GENERAL:

• Lack of material management system • Poor housekeeping & storage condition • Poor quality control • Adhoc procurement • Contractors negligence • Unconcerned supervisory staff • Untrained labor • Non-use of left over materials• Theft and pilferage • Change in design and specification • Improper handling • Loss during transportation and application.

SPECIFIC:

• Wrong use of various grade of metal • Silt content in sand • Improper cutting of steel • Use of dry cement • Non-utilization of cut piece of steel Mishandling of cement bags • Excess mortar/concrete preparation for cement, sand and aggregates.

PROJECT DELAYS:

• Delays in the preparation and receipt of drawings from consultants. • Lack of planning • Information delay • Delay in approval of design and specification • Change in designs, specifications and materials • Errors in project planning • Personal interests • Unrealistic labor planning • Delay in approvals from government authorities • Problems in contract administration • Poor coordination of activities of contractors and consultants. • Delay in procuring technical expertise • Non availability of power, water and other infrastructural facilities. • Adverse climatic condition • Law and order problems • Contractors and Labor problem • Delay in material selection and approval • Lack of finance • Breakdown in construction equipment.

REDUCTION OF WASTE THROUGH BELOW MENTION POINT:

• Towards Zero wastage

• design stage

• Site management

• Standardization

• Codification Storage

MANAGEMENT FUNCTION:

• Identification (Codification) • Stock control • Indenting • Transport receipt and inspection • Storage • Safety, security, preservation • Issue and dispatch • Disposal of

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scrap/surplus • Identification of obsolete/unserviceable and slow moving item • Stores records/stores accounting • Stock verification.

OVERVIEW OF PAPER:

The aim of this research work is to find reasons of material wastage on construction site of multi storied buildings and how it can be minimized. So, overall project cost can be reduced or profit maximized.

My research study is conducted in Nashik and it's limited to commercial building work. In which 3 different building survey and compare the wastage of building material to each other.

The Data on estimated and actual consumption of major materials, namely: Cement, Reinforcement steel, Bricks, Sand and Coarse Aggregate are collected. For each projects negative variance or wastage worked out. From this wastage, which effected on productivity of project.

V. STUDY RESULTS

Suggestion for reducing wastage:

• Strict supervision and control of materials

• Creating an awareness of consequences of waste and educating staff.

• Correct material planning and ordering.

• Intensifying security

• Effective site management

• Introducing incentive schemes.

• Improving material quality

• Improving storage facilities.

• Good line of communication between top management and workers.

• Use of shop made item like door/window frames.

• Imposing conditions to minimize wastage when negotiating workers/sub-contractors.

• Establishing proper method of measuring sand, aggregate purchasing.

• Improving transport system.

VI. CONCLUSION

In construction industries, there are numbers of constraints eg. Labor, Environment, Location. So, zero waste is not possible for any type of project.

Even after some extent of wastage rate allowable in each project, this limit extended beyond the allowable limit, which ultimately effect on project profit or return on investment (ROI).

In our case it should be obvious from result, that the actual consumption exceeded the estimated consumption for every item, in every project, i.e. the incidence of wastage is universal.

To compare the material wastage on different construction of project at Nashik and also give the necessary suggestion for reduce waste at site.

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REFERENCES

[1] UFRGS, Shingo's Seven Wastes (1989)

[2] Atit Shah, Project Construction Consultancy

[3] Waste Materials in Construction, 1st edition, May 2000

[4] Reuse of Materials and Byproducts in Construction, by Richardson, 2003

[5] Material Wastage in Construction Activities, Article on researchgate.net, january2000

 DOI : 10.35291/2454-9150.2020.0542